Amendments to the Claims:

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1.   (Currently Amended) An image recording apparatus comprising:

a first converting unit ~~for converting~~ that receives image data and converts the image data into primary data having an N-bit range according to a first gradation conversion characteristic;

a second converting unit ~~for converting~~ that receives the same image data received by the first converting unit and converts the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in ~~the~~ a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N;

a dissimilarity calculating unit ~~for calculating~~ that receives the primary data and the secondary data and calculates dissimilarity between the primary data and the secondary data according to each position of each pixel and ~~employing~~ uses data regarding the calculated ~~data~~ dissimilarity ~~as~~ to output tertiary data; and

a recording unit for recording the primary data and the tertiary data in a file.

2.   (Original) The image recording apparatus according to claim 1, wherein the recording unit records the primary data in an image storage segment to be preferentially referred to, which is in the file.

3.   (Original) The image recording apparatus according to claim 2, wherein the recording unit records the tertiary data in an application segment optionally able to be added, which is in the file.

4.   (Currently Amended) The image recording apparatus according to claim 1, wherein the first gradation conversion characteristic and the second gradation conversion

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characteristic have the a same characteristic curve in at least a part of an entire input signal range.

5.   (Canceled)

6.   (Original) The image recording apparatus according to claim 1, wherein the recording unit compresses the tertiary data by nonlinearly quantizing it and records the compressed tertiary data in the file.

7.   (Original) The image recording apparatus according to claim 1, wherein the recording unit compresses the tertiary data by increasing a sampling increment of the tertiary data on an image space and records the compressed tertiary data in the file.

8.   (Original) The image recording apparatus according to claim 1, wherein the recording unit discriminates non-correlation regions that are image areas where a substantial dissimilarity exists between the primary data and the secondary data, and records the tertiary data in the file in a manner that the tertiary data is divided into map data indicating shapes of the non-correlation regions and data indicating values of the non-correlation regions.

9.   (Original) The image recording apparatus according to claim 1, wherein the recording unit discriminates a non-coincidence position that is a position in an image where the secondary data cannot be calculated directly from the primary data, and records the tertiary data at the non-coincidence position in the file.

10.   (Original) The image recording apparatus according to claim 1, wherein the recording unit compresses the tertiary data by run-length coding, entropy coding, and/or predictive coding, and records the compressed tertiary data in the file.

11.   (Original) The image recording apparatus according to claim 1, wherein the second converting unit changes the second gradation conversion characteristic in accordance with a feature of the image data.

12.   (Currently Amended) An image recording apparatus comprising:

a first converting unit ~~for converting~~ that receives image data and converts the image data into primary data having an N-bit range according to a first gradation conversion characteristic;

a second converting unit ~~for converting~~ that receives the same image data received by the first converting unit and converts the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in ~~the~~ a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N;

a dissimilarity calculating unit ~~for calculating~~ that receives the primary data and the secondary data and calculates dissimilarity between the primary data and the secondary data according to each position of each pixel and ~~employing~~ uses data regarding the calculated ~~data as~~ dissimilarity to output tertiary data; and

a recording unit for recording the primary data and the tertiary data in a file, wherein

said recording unit is a unit for irreversibly compressing the primary data and recording the irreversibly compressed primary data, and

said dissimilarity calculating unit is a unit for expanding the irreversibly compressed primary data, calculating data that determines correlation between the expanded primary data and the secondary data, and employing the calculated data as the tertiary data.

13.   (Original) The image recording apparatus according to claim 12, wherein the recording unit records the primary data in an image storage segment to be preferentially referred to, which is in the file.

14.   (Original) The image recording apparatus according to claim 13, wherein the recording unit records the tertiary data in an application segment optionally able to be added, which is in the file.

15. (Currently Amended) The image recording apparatus according to claim 12, wherein the first gradation conversion characteristic and the second gradation conversion characteristic have ~~the~~ a same characteristic curve in at least a part of an entire input signal range.

16. (Canceled)

17. (Original) The image recording apparatus according to claim 12, wherein the recording unit compresses the tertiary data by nonlinearly quantizing it and records the compressed tertiary data in the file.

18. (Original) The image recording apparatus according to claim 12, wherein the recording unit compresses the tertiary data by increasing a sampling increment of the tertiary data on an image space and records the compressed tertiary data in the file.

19. (Original) The image recording apparatus according to claim 12, wherein the recording unit discriminates non-correlation regions that are image areas where a substantial dissimilarity exists between the primary data and the secondary data, and records the tertiary data in the file in a manner that the tertiary data is divided into map data indicating shapes of the non-correlation regions and data indicating values of the non-correlation regions.

20. (Original) The image recording apparatus according to claim 12, wherein the recording unit discriminates a non-coincidence position that is a position in an image where the secondary data cannot be calculated directly from the primary data, and records the tertiary data at the non-coincidence position in the file.

21. (Original) The image recording apparatus according to claim 12, wherein the recording unit compresses the tertiary data by run-length coding, entropy coding, and/or predictive coding, and records the compressed tertiary data in the file.

22.   (Original) The image recording apparatus according to claim 12, wherein the second converting unit changes the second gradation conversion characteristic in accordance with a feature of the image data.

23.   (Currently Amended) A computer-readable recording medium on which an image processing program is recorded, the image processing program comprising instructions to cause a computer to perform the steps of:

receiving and converting image data into primary data having an N-bit range according to a first gradation conversion characteristic;

receiving the same image data received in the first step and converting the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in-the a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N;

using a dissimilarity calculating unit for receiving the primary data and the secondary data and calculating dissimilarity between the primary data and the secondary data according to each position of each pixel and-employing using data regarding the calculated data-as dissimilarity to output tertiary data; and

recording the primary data and the tertiary data in a file.

24.   (Currently Amended) A recording medium according to claim 23, wherein the image processing program further comprises instructions to cause the computer to perform the steps of:

recording the primary data by irreversibly converting it; and

expanding the irreversibly compressed primary data, and calculating data that determines correlation between the expanded primary data and the secondary data, and employing the calculated data as the tertiary data.

25.   (Currently Amended) An image recording method comprising the steps of:

receiving and converting image data into primary data having an N-bit range according to a first gradation conversion characteristic;

receiving the same image data received in the first step and converting the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in~~the~~ a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N;

~~using a dissimilarity calculating unit for~~ receiving the primary data and the secondary data and calculating dissimilarity between the primary data and the secondary data according to each position of each pixel and ~~employing~~ using data regarding the calculated ~~data as~~ dissimilarity to output tertiary data; and

recording the primary data and the tertiary data in a file.

26.   (Original) The image recording method according to claim 25, further comprising the steps of:

recording the primary data by irreversibly converting it; and

expanding the irreversibly compressed primary data, and calculating data that determines correlation between the expanded primary data and the secondary data, and employing the calculated data as the tertiary data.

27.   (Currently Amended) An image reproducing apparatus for reproducing a file generated by an image recording apparatus, the image recording apparatus having: a first converting unit ~~for converting~~ that receives image data and converts the image data into primary data having an N-bit range according to a first gradation conversion characteristic; a second converting unit ~~for converting~~ that receives the same image data received by the first converting unit and converts the same image data into secondary data having an M-bit range

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according to a second gradation conversion characteristic that is lower in ~~the~~ a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N; a dissimilarity calculating unit ~~for calculating~~ that <u>receives the primary data and the secondary data and calculates</u> dissimilarity between the primary data and the secondary data according to each position of each pixel and ~~employing~~ <u>uses data regarding</u> the calculated ~~data as~~ <u>dissimilarity to output</u> tertiary data; and a recording unit for recording the primary data and the tertiary data in the file, <u>the image reproducing apparatus</u> comprising:

a reading unit for reading the primary data and the tertiary data from the file; and

a secondary data calculating unit for reproducing the secondary data based on the primary data and the tertiary data <u>read by the reading unit</u>.

28.   (Original) The image reproducing apparatus according to claim 27, wherein the secondary data calculating unit level-compresses the secondary data so that the data has a bit range gradation-reproducible by an external apparatus, and outputs the level-compressed data.

29.   (Currently Amended) An image reproducing apparatus for reproducing a file generated by an image recording apparatus, <u>the image recording apparatus</u> having: a first converting unit ~~for converting~~ <u>that receives image data and converts the</u> image data into primary data having an N-bit range according to a first gradation conversion characteristic; a second converting unit ~~for converting~~ <u>that receives the same image data received by the first converting unit and converts</u> the <u>same</u> image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in ~~the~~ a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N; a dissimilarity calculating unit ~~for calculating~~ <u>that</u>

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receives the primary data and the secondary data and calculates dissimilarity between the

primary data and the secondary data according to each position of each pixel and employing

uses data regarding the calculated data as dissimilarity to output tertiary data; and a recording

unit for discriminating a non-coincidence position that is a position in an image where the

secondary data cannot be calculated directly from the primary data and for recording the

primary data and the tertiary data at the non-coincidence position in the file, the image

reproducing apparatus comprising:

a reading unit for reading the primary data and the tertiary data from the file;
and

a secondary data calculating unit for reproducing the secondary data based on

the primary data and the tertiary data read by the reading unit, wherein

said secondary data calculating unit discriminates the non-coincidence

positions according to pixel values of the primary data, disposes the tertiary data at the

non-coincidence positions and performing performs positioning between the primary data and

the tertiary data, and reproduces the secondary data based on the primary data and the tertiary

data that corresponds to the primary data in pixel position.

30.   (Currently Amended) A computer-readable recording medium on which an

image processing program is recorded, for reproducing a file generated by an image recording

apparatus, the image recording apparatus having: a first converting unit for converting that

receives image data and converts the image data into primary data having an N-bit range

according to a first gradation conversion characteristic; a second converting unit for

converting that receives the same image data received by the first converting unit and

converts the same image data into secondary data having an M-bit range according to a

second gradation conversion characteristic that is lower in the a degree of level compression

than the first gradation conversion characteristic or that causes no level compression, where

M is greater than N; a dissimilarity calculating unit ~~for calculating~~ that receives the primary data and the secondary data and calculates dissimilarity between the primary data and the secondary data according to each position of each pixel and ~~employing~~ uses data regarding the calculated ~~data~~ dissimilarity to output ~~as~~ tertiary data; and a recording unit for recording the primary data and the tertiary data in the file, the image processing program comprising instructions to cause a computer to perform the steps of:

reading the primary data and the tertiary data from the file; and

reproducing the secondary data based on the primary data and the tertiary data read from the file.

31.   (Currently Amended) A computer-readable recording medium on which an image processing program is recorded, for reproducing a file generated by an image recording apparatus, the image recording apparatus having: a first converting unit ~~for converting~~ that receives image data and converts the image data into primary data having an N-bit range according to a first gradation conversion characteristic; a second converting unit ~~for converting~~ that receives the same image data received by the first converting unit and converts the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in ~~the~~ a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N; a dissimilarity calculating unit ~~for calculating~~ that receives the primary data and the secondary data and calculates dissimilarity between the primary data and the secondary data according to each position of each pixel and ~~employing~~ uses data regarding the calculated ~~data as~~ dissimilarity to output tertiary data; and a recording unit for discriminating a non-coincidence position that is a position in an image where the secondary data cannot be calculated directly from the primary data and for recording the primary data

and the tertiary data at the non-coincidence position in the file, the image processing program comprising instructions to cause a computer to perform the steps of:

reading the primary data and the tertiary data from the file; and

reproducing the secondary data based on the primary data and the tertiary data read from the file, wherein

said reproducing discriminates the non-coincidence positions according to pixel values of the primary data, disposes the tertiary data at the non-coincidence positions and performing performs positioning between the primary data and the tertiary data, and reproduces the secondary data based on the primary data and the tertiary data that corresponds to the primary data in pixel position.

32. (Currently Amended) An image reproducing method for reproducing a file generated by an image recording apparatus, the image recording apparatus having: a first converting unit for converting that receives image data and converts the image data into primary data having an N-bit range according to a first gradation conversion characteristic; a second converting unit for converting that receives the same image data received by the first converting unit and converts the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in the a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N; a dissimilarity calculating unit for calculating that receives the primary data and the secondary data and calculates dissimilarity between the primary data and the secondary data according to each position of each pixel and employing uses data regarding the calculated data as dissimilarity to output tertiary data; and a recording unit for recording the primary data and the tertiary data in the file, the image reproducing method comprising the steps of:

reading the primary data and the tertiary data from the file; and

reproducing the secondary data based on the primary data and the tertiary data read from the file.

33.   (Currently Amended) An image reproducing method for reproducing a file generated by an image recording apparatus, the image recording apparatus having: a first converting unit for converting that receives image data and converts the image data into primary data having an N-bit range according to a first gradation conversion characteristic; a second converting unit for converting that receives the same image data received by the first converting unit and converts the same image data into secondary data having an M-bit range according to a second gradation conversion characteristic that is lower in the a degree of level compression than the first gradation conversion characteristic or that causes no level compression, where M is greater than N; a dissimilarity calculating unit for calculating that receives the primary data and the secondary data and calculates dissimilarity between the primary data and the secondary data according to each position of each pixel and employing uses data regarding the calculated data as dissimilarity to output tertiary data; and a recording unit for discriminating a non-coincidence position that is a position in an image where the secondary data cannot be calculated directly from the primary data and for recording the primary data and the tertiary data at the non-coincidence position in the file, the image reproducing method comprising the steps of:

reading the primary data and the tertiary data from the file; and

reproducing the secondary data based on the primary data and the tertiary data read from the file, wherein

said reproducing discriminates the non-coincidence positions according to pixel values of the primary data, disposes the tertiary data at the non-coincidence positions and performing performs positioning between the primary data and the tertiary data, and

reproduces the secondary data based on the primary data and the tertiary data that corresponds

to the primary data in pixel position.